# EMCAP News

Prepared by the ELECTROMAGNETIC COMPATIBILITY ANALYSIS PROGRAM

Volume 15 NSWCDD, Dahlgren, VA 22448-5100 2003




# *Afloat Spectrum Management Initiative . . .*

## EMCAP and CPM to Merge

Afloat frequency planning and spectrum management have traditionally been partitioned by functional area. Hence, communicators do spectrum management as part of the communications planning process, and combat system or electromagnetic warfare operators do their spectrum management independently as part of their planning process. In addition, Intelligence (INTEL), Information Warfare (IW), and Electronic Warfare (EW) mission planners require use and knowledge of afloat frequency assets. In recent years, there has been an introduction of new shipboard systems that require spectrum support, including Commercial Off-the-Shelf (COTS), but a reduction in the amount of spectrum resources available to the Navy. Given these circumstances and the increase in littoral operations, conflicts are highly common among the various spectrum users.

In order to resolve these conflicts and make more efficient use of the limited spectrum resources, an initiative has been launched to consolidate afloat spectrum management functionality for Battle Groups (BGs), Amphibious Ready Groups (ARGs), and Expeditionary Strike Groups (ESGs). This initiative will be pursued concurrently on two fronts: process and software. The process work will seek to streamline and codify the manner in which afloat spectrum management is performed. The end result is expected to be a TACMEMO that describes the steps to be performed in the new process. The software work will automate the process outlined in the TACMEMO. It is envisioned that a single software application will be developed that allows all afloat spectrum users to simultaneously see and update the current and future BG/ARG/ESG spectrum posture.

The new software application is called the Afloat Electromagnetic Spectrum Operations Program (AESOP). Immediately following the most recent releases of the Electromagnetic Compatibility Analysis Program (EMCAP Version 5.0) and Communications Planning Module (CPM Version 6.1), a preliminary version of AESOP (AESOP 0.5) was created. Under AESOP 0.5, EMCAP and CPM are still independent applications united by a single installation package. They do, however, have the ability to share frequency assignment data. This shared data can be used to show a more complete picture of spectrum use and to create a draft of a new OPTASK SPECTRUM output. The concept for OPTASK SPECTRUM is to have a single, standardized format for providing frequency use data for all BG emitters.

*Continued on Page 3*

# Farewell to the EMCAP News!

Dear Readers,

This will be the last volume of the *EMCAP News*. EMCAP along with CPM is in the process of being integrated into a single application called AESOP. We will continue to publish a newsletter every year but under a new name. We would like to thank all the dedicated readers of the *EMCAP News* as well as those who have provided great feedback over the years. We hope that you will continue to support us in our new endeavors.

Rest assured that we will continue to distribute the new newsletter to all addresses in our distribution. If you have any questions about the distribution or AESOP, please feel free to call any one of the numbers below.

## EDITOR'S CORNER

The objective of the *EMCAP News* is to provide the opportunity for

- Exchanging frequency management information among ships and facilities.
- Communicating information about the SPAWAR tools and SPAWAR E9407-AA-GYD-010/(S) OP-3840 "Electromagnetic Compatibility Criteria for Surface Weapon Systems (U)".

*EMCAP News* includes information about the current/next fleet distribution of spectrum management software plus current events. Basically, we'll try to keep you updated on special happenings in the frequency management world. *EMCAP News* is written, edited, and published by all team members. Opinions expressed by the publishers are their own and are not to be considered an official expression of the U.S. Government or the Department of the Navy.

We welcome your comments, contributions, and recommendations. Address all correspondence to the SPAWAR Team at the Executive Coordinator's address listed below or call DSN 249-8021, commercial (540) 653-8021, or FAX (540) 653-2214.

*Executive Coordinator:*

COMMANDER, DAHLGREN DIVISION
ATTN CODE J53 EMCAP
NAVAL SURFACE WARFARE CENTER
17320 DAHLGREN ROAD
DAHLGREN VA 22448-5100

*Radar Points of Contact:* DSN 249-8021, commercial (540) 653-8021, or FAX (540) 653-2214; e-mail address: emcap@nswc.navy.mil
SIPRNET: emcap@nswcdd.navy.smil.mil

*Program Sponsor:*

COMMANDER
ATTN CODE 051-1C
SPACE AND NAVAL WARFARE SYSTEMS COMMAND
4301 PACIFIC HWY
SAN DIEGO CA 92110-3127

*Point of Contact:* DSN 332-7230, commercial (619) 524-7230, or FAX (619) 524-7224; e-mail address: afloatsm@spawar.navy.mil
SIPRNET: afloatsm@spawar.navy.smil.mil

### WEB SITE

For information about the SPAWAR Team and spectrum management guidance, to download unclassified software updates, or to provide feedback, visit our web site:

http://spectrum.nawcad.navy.mil/aesop.html

Details are available about the SPAWAR tools which consist of the Communications Planning Module (CPM), the High Frequency Propagation Module (HFM), Joint Terrain Analysis Program (JTAP), Electromagnetic Compatibility Analysis Program (EMCAP), and the Afloat Electromagnetic Spectrum Operations Program (AESOP); as well as user tips and previews of future enhancements.

### READER PARTICIPATION

Readers are invited to submit articles and photographs to the SPAWAR Team for publication. If you wish to contribute, please send all correspondence to the Executive Coordinator at the address given above. The following guidelines are suggested for submitting material:

1. If sending an article, include the name, address, e-mail, and telephone number of the author and a suggested title.
2. Photographs submitted may be in color or in black-and-white. Provide a caption for each photo to describe the setting and identify people or equipment. Include the photographer's name if available.

# Introducing CPM Version 6.1 for Windows

In April 2000, work began on moving the functionality of the FoxPro-based Communications Planning Module (CPM) to a new Windows version. The new version written in C++, uses a Microsoft Access database to hold reference data, and runs under Microsoft Windows NT, 2000 and XP. The BETA version, 6.0b, was tested by users in San Diego in September 2001 and Norfolk in February 2002.

Different from the old FoxPro versions, the new CPM opens, parses, edits, and saves the actual OPTASK COMM text file. In version 6.0b, CPM had little trouble reading its own OPTASK COMM text file, but difficulties were encountered with files written outside the software. This was due to the fact that communication (COMM) planners in different parts of the world use many variants to the basic OPTASK COMM format in the Allied Planning Publication (APP-4). There were only a few portions of the OPTASK COMM that all users wrote the same. Consequently, a major amount of editing had to be accomplished for the OPTASK COMM to be properly read.

Since the BETA testing, various real-world OPTASK COMM files have been obtained and studied in order to determine the most common features of OPTASK COMM files being used in the Navy today. As a result, software changes were implemented which substantially reduced the previous editing required of an OPTASK COMM prior to its being opened by CPM. An appendix to the CPM Instruction Book expands the instructions for writing the OPTASK COMM message and supplies details on the minor editing still required.

In addition, lessons learned from deployments in support of Operation Enduring Freedom dictated some additional software enhancements that were included in the delivery of CPM Version 6.1 in October 2002.

Basic features of CPM can be found in the *EMCAP News* Volume 14 in the article *"*ASPECTS CPM Version 6.0 is Coming!*"*. In addition to these and the items discussed above, other new features provided by version 6.1 include:

a. Automated generation of window frequencies for all High Frequency (HF) nets in the communications plan.

b. Improved handling of Demand Assigned Multiple Access (DAMA) channelization plans.

c. An enhanced Spectrum Occupancy Display which provides the capability to display Battle Group (BG) communications emitters (from the OPTASK COMM), BG radar emitters (from the EMCAP radar plan), imported environmental frequency use information from a variety of national and international frequency assignment databases, Electronic Warfare (EW) threat information, and Intelligence (INTEL) guardbands.

d. A new output, the OPTASK SPECTRUM, which can provide the embarked Commander a complete listing of all emitters in the BG, Amphibious Readiness Group (ARG), and in Summer 2003 the Expeditionary Strike Group (ESG). This new output is the first attempt at a comprehensive listing of all radio frequency (RF) emitters in the BG/ARG/ESG. User feedback is solicited as to its completeness and utility.

As indicated in the article "EMCAP and CPM to Merge" on the front page, the new Afloat Electromagnetic Spectrum Operations Program (AESOP) software, takes a new approach to afloat spectrum management. AESOP will combine the features of both applications to provide a more complete picture of the spectrum use within the BG/ARG/ESG.

Copies of CPM 6.1 are also available on the web site: http://spectrum.nawcad.navy.mil/aesop.html


*EMCAP and CPM to Merge, from Page 1*

In the coming months and years, AESOP will be built and refined through the use of a spiral development process. This process will use feedback received from each version of the software to implement improvements in the next version. Early AESOP releases will focus on tighter integration of present EMCAP and CPM functionality, while subsequent versions will include INTEL, IW, and EW functionality as part of the automation of the new afloat spectrum management process. Release schedules will be coordinated with BG deployment dates, so watch for the latest AESOP release on your next deployment and be sure to send your feedback.

# *Afloat Spectrum Management Initiative . . .*

## Changing the Process

The need for a more comprehensive approach to Battle Group (BG) and Amphibious Ready Group (ARG) operational spectrum management has been recognized for some time. Various problems have long existed in the methods used, including the following:

- All BG/ARG emitters are not known or listed in OPTASK COMM messages.
- Communications (COMMs) and Radar frequency plans, operational frequency assignments, and the associated circuit/system descriptions are displayed in different ways by separate software applications, usually hosted on separate ships within the BG/ARG.
- Operational planners have not had a tool capable of identifying and displaying the entire electromagnetic posture for their own force and/or other friendly/foe users within the electromagnetic battle space.
- No operational system is available to verify/compare the planned frequency use with the actual frequencies being used by afloat forces for all frequency bands.

In May 2001, these problems received additional attention when COMCARGRU SEVEN N6 expressed serious concerns with the lack of automation present in BG spectrum management. A subsequent meeting was chaired by COMTHIRDFLT in July 2001 to discuss these concerns in detail. Various BG spectrum management problems were addressed, including a lack of policy and direction regarding the BG spectrum management process. Various software applications and technologies were discussed as possible methods available to implement efficient sharing of information, as well as assisting in the overall BG spectrum management process. The seriousness and possible negative impact(s) of these problems have been recognized, and SPAWAR is assisting in updating the afloat spectrum management process.

While OPNAV and SPAWAR are assisting in this process update by providing new software capabilities for the afloat spectrum manager, there are some steps the fleet should take to get a better handle on the spectrum usage.

In order for the BG Information Warfare Commander (IWC) to properly manage and control the spectrum within the force, an awareness of the frequencies being used must be realized. This has become a most difficult proposition, because of the proliferation of new communications and other devices, including Commercial Off-the-Shelf (COTS) equipment, within the BG.

The OPTASK COMM message containing the BG communications plan has been used primarily for standard tactical communications nets. New net titles are now being used without a Navy-wide reference, causing a lack of standardization among BGs. Publications that are available do not address all communications emitters within a BG. Because of this, many non-tactical communications-related emitters have not been addressed. Examples of these omitted emitters are:

a. Flight Deck Communications System (FDCS)
b. Damage Control Communication Systems
c. Wireless Local Area Networks (LANs)

Additionally, new types of communications nets are introduced into the fleet on a continuing basis. These new systems are not added to publications or other policy documents in a timely fashion and consequently are often left out of the OPTASK COMM. Examples of these nets are:

a. Digital Wideband Transmission System (DWTS) (AN/SRC-57)
b. UHF Medium Data Rate (MDR)
c. International Maritime Satellite (INMARSAT)
d. Challenge Athena (AN/WSC-8)
e. Hierarchical Yet Dynamically Reprogammable Architecture (HYDRA) Radio (AN/SRC-55)
f. BG Cellular Phone
g. HF BG Email
h. SHF SATCOM (AN/WSC-6)
i. EHF SATCOM (AN/USC-38)
j. Enhanced Position Locating and Reporting System (EPLRS/PLRS)

*Continued on Next Page*

*Changing the Process, from Previous Page*

There is another group of emitters that are often not listed in any BG COMM plan. These emitters are neither COMM nor radar related, and have no standard plan in which to reside. Examples are:

a. Tactical Air Navigation (TACAN) and other Navigational Aids (NAVAIDS)
b. Joint Tactical Information Distribution System (JTIDS)/LINK 16
c. Tactical Environmental Support System (TESS) (AN/UMK-3)
d. Satellite Weather System (AN/SMQ-11 type)

BG frequency planners must ensure that all these systems are included in the overall emitter listing for the BG in order to have a complete picture of the friendly electromagnetic environment. If communications related, a "spare" line number may be assigned to nets not listed in the governing document(s). If radar related, the emitter should be included in the BG radar plan.

Once these emitters are identified, they may then be displayed or documented by the new software available.

A related fact is that communications planning is accomplished at the BG/ARG staff, while radar planning is commonly done by the lead Anti-Air Warfare (AAW) ship, which is typically an Aegis cruiser. This planning will also include the Expeditionary Strike Group (ESG) in Summer 2003. In order for the combined process to work to its full potential, both functions should be managed at the staff level.

# EMCAP Supports Ballistic Missile Defense System

Over the past 24 months, the EMCAP team has supported the Seabased MidCourse Defense (SMD) element of the Ballistic Missile Defense System (BMDS). This system, formerly known as the Navy Theater Wide (NTW) Ballistic Missile Defense (BMD), will provide the capability for U.S. Navy Aegis surface combatants to utilize hit-to-kill technology to destroy or negate Medium Range to Inter-Continental Ballistic Missiles (ICBM) in the midcourse phase of the exoatmospheric battlespace. SMD will capitalize on Navy combatants' unique mobility to effect ascent phase, midcourse intercepts early in the ballistic missile threat trajectory, thereby acting synergistically with the Boost, Ground-Based Midcourse and Terminal Defense layers of the BMDS to provide an additional layer of defense to the BMDS. SMD will provide a capability for homeland defense and defense of deployed U.S. forces, friends, and allies while the Aegis surface combatants are forward deployed or on fleet missile defense patrols.

Several new features were added to the EMCAP 5.0 software in order to support the SMD program. The planning board view was expanded so that map area with a radius of 1400 nm from the center point of the map can be viewed. The range radars and support aircraft at Pacific Missile Range Facility in Kauai, Hawaii, and the Ronald Reagan Ballistic Missile Defense Test Site at Kwajalein Atoll were added to the EMCAP database. For each Flight Mission (FM) event, an electromagnetic compatibility analysis of the range radars, support aircraft, and shipboard radars is performed to minimize electromagnetic interference (EMI) during the Standard Missile-3 (SM-3) missile launch. An EMCAP plan and supporting EMI interactions and victims analysis reports were generated and passed to the Aegis ship and coordinating authorities prior to the launch.

June 13, 2002, was the date of the SMD's fourth successful flight and second target intercept. In this test, an Aries target was launched from Kauai, Hawaii. The USS LAKE ERIE (CG 70) tracked the target as it rose above the horizon and then launched the SM-3 missile, which intercepted the target approximately 100 standard miles above the ocean. SM-3 is designed to intercept an incoming theater ballistic missile outside the earth's atmosphere. The latest successful flight mission was on November 21, 2002. In this test, the USS LAKE ERIE (CG 70), equipped with the Aegis BMD computer programs and equipment, developed a fire control solution without any external sensor inputs. Within two minutes after target launch, the Aegis Weapon System fired the SM-3 guided missile. Approximately two minutes later, the missile's warhead acquired, tracked, and diverted into the target, demonstrating the Aegis BMD system's capability to engage the ballistic missile target in the ascent phase.

More information about the Ballistic Missile Defense System can be found at www.spaceref.com/news or www.defenselink.mil/news

# What Should I Do About This?

## EMCAP System Operational Guidance

As the electromagnetic spectrum continues to be utilized by commercial and military systems around the world, frequency management becomes increasingly complex. There are still potential interference problems even when using the most optimal frequency assignments available. In some cases, there will be a workaround to the problem; in other cases there may not. The EMCAP Assignment message includes operational guidance that considers the systems involved in your battle group as well as their geographic location. This guidance is intended to provide you with additional methods for operating your radars most effectively.

### Legal Disclaimer!

*EMCAP does not, however, provide advice on how to deal with large, prehistoric, winged animals that appear on your radar scope. You are on your own if that happens.*

OK, since that is out of the way, let's get to the good stuff – what sort of guidance can you expect to see in your EMCAP Assignment message?

### Restricted Frequencies

Well, this hardly qualifies as "good stuff" - however, when operating close to land, it is likely that some frequencies will be prohibited from use in order to protect the primary user[1]. For example, use of Battle Group Cellular (BG CEL)/MCIXS is unauthorized while in port at Bahrain and United Arab Emirates because it causes interference to local telecommunications systems. The EMCAP Assignment message includes a list of frequency guardbands[2] and/or system restrictions[3] in order to let participants know which frequencies are prohibited from use.

To request permission to radiate on restricted frequencies, you should contact the local area frequency coordinator. Note that some operational areas have specific procedures to follow when making such a request. When applicable, these procedures are included in the EMCAP Assignment message and consist of such items as: where to submit radiation requests; what to include in the request and relevant time constraints when making a request. For some systems, Planned Maintenance System (PMS) procedures for use with frequency restrictions are also included in the EMCAP Assignment message.

### Residual Interference

Have you ever tried to fit twenty-five people in your car? Unless you have the circus "clown car," eventually you reach a point where you just cannot fit anyone else in (well, not comfortably anyway) – your car simply cannot accommodate everyone, and the result is that someone's elbow ends up in another person's ear.

The same type of problem occurs within the electromagnetic spectrum when trying to accommodate all the radars in a battle group. The spectrum is a finite entity and eventually there is just no more room. Overcrowding or "saturation" of the spectrum will usually begin to occur with a battle group of six to eight ships, depending on the composition of the group. The result of overcrowding in this case is electromagnetic interference (EMI). This can occur even when using the most optimal frequency assignments available. The EMCAP Plan provides a variety of guidance and recommendations to help you get the most out of your radars, even if the spectrum is a bit over-tasked.

Some of this guidance is tailor-made for issues that are unique to a specific system. For example, guidance exists for when and how to use the strapped channels of the AN/SPS-40, as well as display suggestions for class B1 navigation radars, including the AN/SPS-64 and AN/SPS-73.

*Continued on Next Page*

[1] The primary user of a frequency is that vexatious system that has top priority for the frequency and requires other users to shut down if they cause interference. Sometimes you get to be the vexatious system – other times you get to be vexed.

[2] A guardband is a frequency or range of frequencies that your systems may not use because of a vexatious primary user (see footnote above).

[3] A system restriction is a frequency or range of frequencies that a specific system may not use because it causes interference to a vexatious primary user (see footnote, well, you know the drill by now, right?).

Other guidance, including alternate assignments, ship location, guidance-only systems, and region-specific guidance, applies to several systems. More detail on each of these is provided below.

### Alternate Assignments

Many frequencies that are restricted protect shore-based systems. The good news is that, as you move farther away from shore, many of these frequencies will eventually become available. The EMCAP Plan provides alternate assignments for certain systems in order to maintain a valid and effective frequency management plan, even if the initial conditions are slightly altered. Blue-water assignments, which are valid for areas with no system restrictions, are created for the AN/SPS-40, AN/SPS-48, AN/SPS-49, AN/SPS-67, AN/SPY-1 and Target Acquisition System (TAS) MK 23.

The EMCAP Plan also provides alternate assignments for a variety of other reasons. The MK 92 MOD 1/2/5 is given a fixed-frequency alternate assignment for operations using the moving target indicator (MTI) mode. The AN/SPN-43 is given a secondary frequency as an alternate that allows a frequency diverse choice. The AN/SPQ-9A/B is given alternate assignments that use frequencies outside of the primary assignment group. Unassigned Standard Missile (SM) Illuminator channels are distributed as alternates to Aegis destroyers and cruisers that carry the SM-2 BLK IV.

### Ship Location

In the same spirit of adding flexibility to the EMCAP Plan, guidance is provided regarding the location of ships in relation to each other.

Frequency and distance information is included to protect systems from damage due to high power radiation and to provide alternatives as conditions change. This distance guidance comes from sources such as Aegis class advisories and current naval messages and is summarized in the EMCAP Plan. For example, AN/SPY-1 guidance recommends a minimum distance for high power, and one for global low power, that will prevent commercial Global Positioning System (GPS) burnout, AN/SLQ-32 receiver burnout and waveguide arcing.

Sectoring recommendations are also available for AN/SPY-1. This approach is useful when dealing with interference to the AN/SPN-43 and to Challenge Athena. Sectoring is also advised for the DA-08, a Dutch-manufactured system, as well as AN/SPY-1 to avoid interference to a Canadian satellite ground receiving station in Halifax, Nova Scotia.

### Operational Guidance

Some systems are included in EMCAP for the purpose of providing operational guidance pertaining to that system. These systems are not given an assignment and can be recognized in your EMCAP workspace by the black-dot that appears next to the system name in the Participants View. Some examples of such system guidance include the minimum frequency separation between transmitter and receiver of the Digital Wideband Transmission System (DWTS), and interference from the Joint Tactical Information Distribution System (JTIDS) to navigational aids. Also included are channels that should be avoided by Tactical Air Navigation (TACAN) systems in order to minimize interference to the Identification Friend or Foe (IFF) system, and possible AN/SLQ-32 interference exchanges with other systems.

### Shore-Based Systems

Unfortunately, spectrum management does not end once radar coordination within the battle group is complete. There are also shore-based systems to consider and these change depending upon the operational area. The EMCAP Plan includes substantial guidance for systems when operating in the Halifax, Nova Scotia area off Canada. Information is provided about the likelihood of interference to commercial receivers, and guidance is given on how to avoid such interference. When operating in Japan, guidance is given regarding the use of navigation radars, including the frequency bands restricted from use in order to avoid interference to television and radio broadcasts.

### Sources of Guidance

So where does all of this wisdom come from? The guidance found in EMCAP is compiled from a variety of sources, including Aegis Class Advisories, naval messages, and official Navy documents. The National Telecommunications and Information Administration (NTIA) Manual, naval messages, regional restriction documents, Radio Frequency Interference (RFI) Advisory, and specific system documents, such as the TAS MK 23 Radar Restrictions SMS Technical Bulletin 9.0-18 are all located on EMCAP Version 5.0 Disc 2 compact disc (CD) in ".pdf" file format.

Though EMCAP cannot increase the amount of spectrum available for use, it can help you make the most of it. Operational system guidance, along with smart spectrum use, will allow combat systems to perform at the best of their ability in a given environment.

# Topside Design:

## Clearing the Fog of War

*"The coup d'oeuil (a glance embracing a wide view) is a gift of God and cannot be acquired; but if professional knowledge does not perfect it, one only sees things imperfectly and in a fog." Chevalier Folard 1724*

This statement by Folard is the earliest reference to the "fog of war." While weapons systems have changed dramatically since 1724, the fog of war still lingers over the battlefield. Originally, the fog of war was the smoke of one's own cannon. While Naval Surface Warfare Center Dahlgren Division (NSWCDD) still tests naval guns, the fog of war in our time appears on radar screens across the battle group. As before, the primary source of the fog is one's own equipment, but now this equipment consists of electromagnetic emitters such as radars and radios. The fog is now known as electromagnetic interference or EMI.

To combat this EMI, the Navy has involved engineers in the design and development of new radar and communication systems from their inception. To deal with the multitude of systems that currently exist on ships, the Navy also employs engineers to manage the topside configuration of the ships. The topside design engineer's task is to ensure that the positioning of the new system does not create such a fog for any system or its operator. Topside configuration management starts with a thorough topside survey.

A topside survey includes locating, identifying, and photographing all radar and topside communication systems onboard ship. The cables associated with these systems are tracked to their termination, and the room and system are noted. Exact measurements of each antenna's location must be obtained during the survey. These measurements are entered into the three-dimensional model, which yields the coordinates for exact frame number, distance port or starboard of centerline, and height above baseline. Once the exact locations of antennas are known, simulations can be run to determine the potential interference between shipboard systems.

Efficiently engineered ship topsides will provide the foundation for well-balanced spectrum allocation, thus allowing each system to operate at its peak performance and provide the ship with the best possible detection and protection. The job of EMCAP to increase spectrum compatibility is then made easier both from the perspective of intra-ship EMI and inter-ship EMI.

On 15 July 2002, a topside survey was conducted aboard USS IWO JIMA (LHD 7). Members of the topside survey team, representing NAVSEA PMS-470, NSWCDD, Anteon Corp. and Northrop Grumman, arrived pierside in Norfolk. The team completed the survey of the newest amphibious assault ship in just four days. The crew of the USS IWO JIMA was very supportive of the team. It was a most informative journey for the team, and was even the first time aboard a Navy ship for some.

The survey measurements were used to update the 3D computer model. Upon completion of the updates, a topside survey report compact disc (CD), including an updated antenna list (x,y,z coordinate location, as well as the below deck terminations) and all photographs of the ship and her antennas was provided back to the Electronics Material Officer (EMO), LCDR (SEL) Skip Paetz of USS IWO JIMA and for use by other members of the topside community, including, Space and Systems Command, Naval Air Systems Command, Naval Sea Systems Command, and Norfolk Naval Ship Yard.

Team members included:
NAVSEA PMS-470
NSWCDD
Anteon Corp
Northrop Grumman

# *Afloat Spectrum Management Initiative . . .*

## Frequency Management Help is on the Way!

For years, there has been a shortage of school-trained spectrum managers on Battle Group (BG)/Amphibious Readiness Group (ARG)/Expeditionary Strike Group (ESG staffs in the fleet. Now, with new Afloat Spectrum Management Initiatives being introduced to assist the Information Warfare Commander (IWC), supplying a properly trained spectrum manager to these staffs has become even more important.

Because ships and battle groups are not assigned frequencies on a permanent basis, and therefore are not required to maintain databases of frequency assignments like shore commands, it has been hard to justify billets for these school-trained personnel afloat. However, the basic principles of spectrum management and electromagnetic compatibility apply to all emitters, not just communications or radars.

Things are finally changing. Billets have been established at most BG/ARG Commanders' staffs (CARGRUs, CRUDESGRUs, PHIBGRUs and PHIBRONs), and personnel are being ordered in. They can provide help for the IWC in a variety of ways, including communications and radar planning, interference resolution, frequency restrictions, and coordination with Joint Task Force (JTF) Commanders and foreign governments.

More information on personnel trained as frequency managers may be found in "FREQUENCY MANAGERS – Who are they and where do they come from?" in *EMCAP News*, Vol 11, Issue 1, 1998. This training is received from the Interservice Radio Frequency Management School (IRFMS), Keesler Air Force Base (AFB), MS. Navy students include sailors from the IT rating (E5 – E9) and government employees working in frequency management jobs ashore. Navy graduates are awarded the NEC IT-2301.

In addition to frequency management topics, such as national and international policy and coordination of spectrum use, the school trains students to ensure communications systems, radars, fire-control systems and navigational aids all work together harmoniously in our cluttered shipboard environments. Also taught are systems currently in use by other agencies and services such as microwave and troposcatter, frequency modulated (FM) ground-to-ground networks, tactical air control systems, Federal Aviation Administration (FAA) radars, Identification Friend or Foe (IFF), glide slopes and localizers.

As we attempt to streamline the afloat spectrum management process, these personnel can be used to bridge the understanding gap between communications, radar and other personnel to ensure the inclusion of all BG emitters.

# ENGINEERING SPOTLIGHT

## Radar Frequency Allocation

Historically, the Navy has been blessed with a suite of radars that span a wide frequency range. Propagation of electromagnetic waves is different in the various frequency bands, making some bands more suitable for long-range detection and others more suitable for tracking and guidance. Also, the wide span of frequencies makes jamming and eavesdropping by enemies more difficult. It is very difficult to make an airplane stealthy against low-frequency radars, such as the AN/SPS-40, AN/SPS-49, AN/APS-145.

The military, especially the US military, use the electromagnetic spectrum more intensively than ever as well as civilians worldwide; therefore, accommodating military spectrum requirements is becoming increasingly difficult.

The operating frequencies for radars, radios, televisions, navigation aids and other devices that use the electromagnetic spectrum are coordinated on a world-wide basis by the International Telecommunications Union (ITU), which is an agency of the United Nations (UN). The ITU was formed in 1865 and was later adopted by the UN.

From time to time, the ITU re-allocates spectral bands from one type of service to another. Lately, the ITU has been re-allocating frequency bands formerly used for radar to other services, including cellular phones and digital data links. This is a problem for the Navy because the re-allocated frequencies were often used for radar. Within the past 30 years, the AN/SPS-49 radar has lost about half of its operating band and the AN/SPN-43C has lost all of its band, at least as a primary user. In the AN/SPN-43C tuning range, the radar is a secondary user, meaning that it is not permitted to cause interference to the primary user (microwave communication links, both ground-to-ground and space-to-ground). When there was little or no commercial use for the microwave frequency bands, they were given to the military and amateurs, but the times of generous frequency allocations for the military are over as the commercial sector expands.

Amidst all of this bad news is one small piece of good news. The frequency band from 2900 to 3100 MHz is likely to have its primary user changed from radio navigation (mostly bridge radars) to radio navigation plus radio location as co-primary users. The ITU uses radio navigation and radio location as part of its language instead of the more common term, radar. Radio location generally refers to radars that find (locate) things, like airplanes. This is important because radio location radars, like the AN/SPS-48E, currently use this band as a secondary user.

In addition, this band is adjacent to the 3100 - 3500 MHz band which is also used for radio location either on a primary or secondary basis. Radars that have exceptional range resolution need a lot of bandwidth. Having a contiguous frequency band for radar from 2900 to 3500 MHz allows the possibility of placing a radar in this band with a smaller range resolution, such as one foot instead of several feet. This is useful for target identification or battle damage assessment.

The re-allocation of the 2900 to 3100 MHz band is likely to occur because extensive testing has shown that radio location radars will not interfere with radio navigation radars. This is not surprising, since the two types of radars have similar waveforms and the radio navigation radars have co-existed with each other for many years. Nonetheless, the evidence of compatibility between the two types of radars was gathered for presentation to the ITU. Specifically a measurement was made of the interference to an AN/SPS-73 radio navigation radar from an AN/SPS-48E radio location radar.

In the US Navy, all AN/SPS-73 radars use X-band (near 9410 MHz), but there is an S-band model which nominally uses 3050 MHz. This lies in the band used by the AN/SPS-48E. The Coast Guard, which uses S-band AN/SPS-73 radars, made one available near Curtis Bay, Maryland, for the measurement. The AN/SPS-48E signal was recorded from the radar at the Guided Missile School at Dam Neck, Virginia Beach, Virginia.

During the measurements, it was quickly evident that the signal processing on the AN/SPS-73 was easily able to remove the emissions of the AN/SPS-48E from the display. This capability is necessary for all bridge radars, because they are usually not tunable (frequency cannot be changed) and they are manufactured with similar frequencies.
The ITU is likely to make a decision about the re-allocation for the radio location radars in 2003. Decisions made in 2003 may take effect quickly, or may be phased in over a period of years.

# EMCAP CROSSWORD PUZZLE

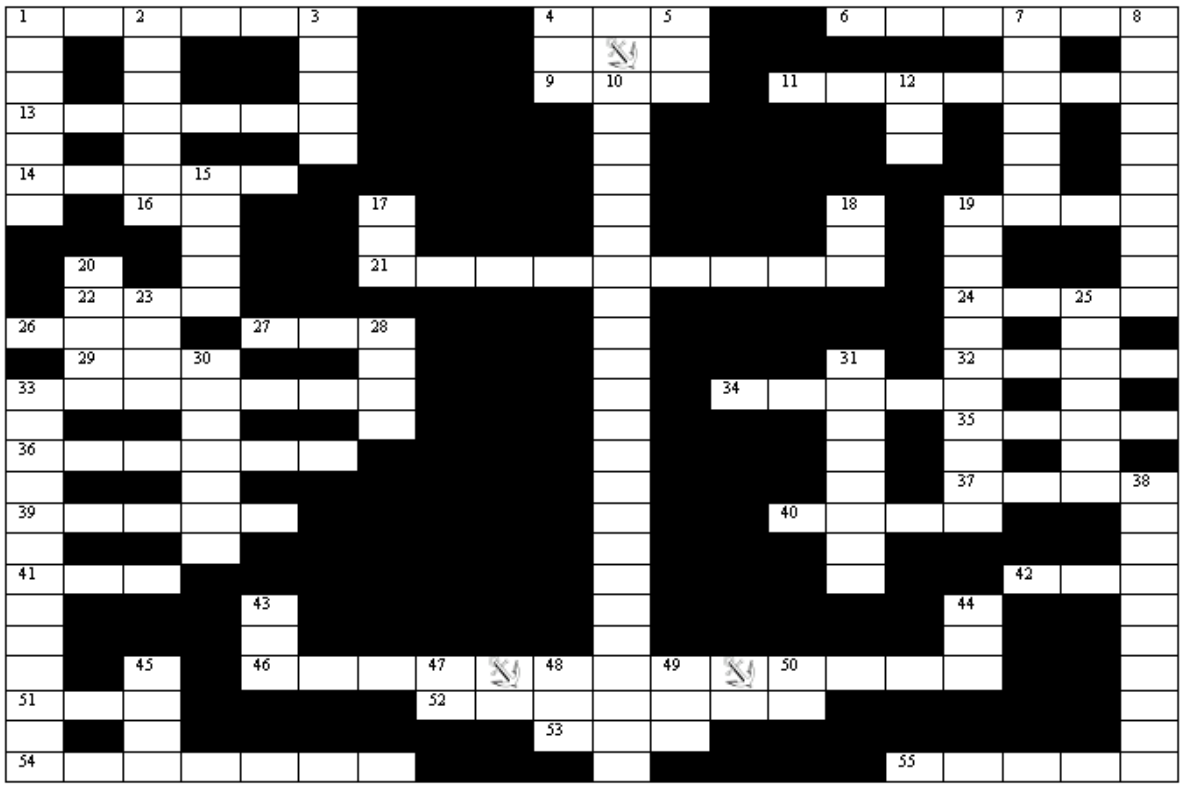
*Answers to this crossword are on page 27*

**Across**

1. Found in malls
4. Land, air and ___
6. Crazy person
9. Holds a golf ball
11. Ghostly figure, apparition
13. Used to moisturize hands
14. Crosspiece, extends from shank near top of anchor
16. Negative answer
19. Snakes (type of cobra)
21. Plate _____ (geology)
22. Gorilla
24. Used by firefighters
26. To and ____
27. Row a boat with this
29. Female parent
32. Type of fruit
33. Type of light
34. End of arms on anchor, sticks in the ground
35. To take pleasure in
36. Law enforcers
37. Narrow valley
39. Criminal
40. Storage for farmers
41. Singular
42. Pasty Hawaiian food
46. Grand event
48. Did at mealtime
50. Means "and this, too"
51. Feeling unwell
52. Land features
53. Sever
54. On birthday cakes
55. Tip of an anchor, end of shank where arms meet

**Down**

1. Fashionable
2. Stand while clapping
3. Center of anchor, from ring to crown -stock and arms extend from this
4. Did this in a chair
5. How old you are
7. Narrow connecting land
8. Heavy and bulky
10. Used by radars, cell phones, etc. (2 words)
12. Bottom of anchor, connects crown to fluke
15. 2-door car
17. Painting, sculpture, etc.
18. Mass transportation
19. Group of islands
20. Bad _____
23. Swim in this
25. Clamp used to attach anchor chain to the ring
28. Top of anchor, put shackle on this
30. To watch or track
31. Purpose
33. Feigns illness
38. Art of finding one's way
43. Tells price
44. Long, long ___
45. Arrange details
47. Indicates presence
48. Arch or curve
49. Do when hungry
50. One



COORDINATOR'S CORNER

Questions for this column should be submitted to the Executive Coordinator at the address given on page 2.

# Questions and Answers

***Q: I recently received EMCAP Version 5.0. After installing the new version, I opened an old EMCAP plan (.emx file) and noticed some of my radar systems were shown in the Participants View with a white "dot" next to them. What gives?***

**A**: The EMCAP 5.0 installation copies both a new version of the software and a new database to your computer. If you did not "merge" your database during the installation, but instead chose to overwrite your current database with the 5.0 database, you may have lost data associated with a system. Since the radar system that was saved in your old .emx file no longer exists in the database, the system will appear as a white dot in the Participants View. This indicates that the system appeared in a previous version of the EMCAP database, and although still saved in your .emx file, no longer exists in the system table of the new EMCAP database. In this case, you may want to reenter the system information by right clicking on the system and selecting Properties, or you may choose to remove or update the system on that platform as appropriate.

In some cases, the radar may appear with a white dot simply because it was removed from the EMCAP 5.0 database. For instance, if you installed an AN/SPS-40 on a platform in a previous version of EMCAP, you may see a white dot next to that system. The AN/SPS-40 has been removed from the EMCAP 5.0 database and replaced with specific variants of the AN/SPS-40 (AN/SPS-40D, AN/SPS-40E, etc.) In this case, you probably want to delete the AN/SPS-40 from the platform in the Participants view and reinstall the appropriate AN/SPS-40 variant to that platform.

***Q: My office has a copy of EMCAP's technical reference manual, OP-3840 Rev 2 from Dec 1999. Is there a newer release?***

**A:** Revision 3 of OP-3840 dated 1 August 2002 replaces Revision 2. More than a simple update of existing information, Revision 3 was re-written to focus on naval shipboard radars that are currently active in the U.S. fleet. This latest revision of OP-3840 was distributed on the EMCAP 5.0 Installation compact disc (CD) and the AESOP 0.5 Installation CD.

***Q: I plan to operate in a littoral area where there is steep mountain terrain. When looking at the EMI Levels predicted by EMCAP, I don't notice any difference when there is a mountain in the path. Can EMCAP take the local terrain into account when making EMI predictions? If so, how do I do this?***

**A**: Yes, EMCAP can be set to consider the local terrain when making EMI predictions. There are two things that you must do, however, to ensure that the predictions are made properly. First, you must select one of EMCAP's propagation models that make terrain-based predictions. In EMCAP Version 5.0 these are the Advanced Propagation Model (APM) and the Terrain Integrated Rough Earth Model (TIREM). Each model has its advantages, but, in general, APM is designed to consider a wider variety of radiowave propagation phenomena (e.g., ducting), while TIREM runs more quickly.

Next, you must have the appropriate Digital Terrain Elevation Data (DTED) for your area of interest on your system. If you do not, EMCAP assumes sea level for elevation points. DTED is distributed by the National Imagery and Mapping Agency (NIMA) on compact disc (CD). Each CD contains DTED for a specific area of the world. To use them with EMCAP, you can either insert them into your CD drive as prompted or copy the CDs in their entirety to your system (either your workstation or network server) and set EMCAP's DTED path to this location. EMCAP uses DTED Level 1.

When performing terrain-based EMI predictions, keep in mind that additional execution time may be required. This is because of the increased complexity of the calculations that must be performed. Depending upon the size of the platform groups and the number of variations in the terrain, this increased time may be considerable.

***Q: Should someone like the JFMO, the AFC, or the EMCAP team review my EMCAP Plan before I send it to all the units?***

**A:** Review of EMCAP Plans prior to dissemination is not required and typically is not necessary, but it is an option available to you. Most EMCAP Plans do not need any review outside your ship or command staff prior to sending them out. The appropriate Area Frequency Coordinators (AFC), such as the Joint Frequency Management Offices (JFMOs) for LANT and PAC, are automatically included as "info" addressees on EMCAP Plan naval messages that are generated by the EMCAP software. The EMCAP Office is also included on all naval messages that are created by the EMCAP software. If problems are noted, you will be contacted for clarification. Therefore, it is important that you complete the point of contact information when generating messages.

*Continued on Next Page*

*Coordinator's Corner, from Previous Page*

Whether you wish to send an advance copy of your EMCAP Plan to the EMCAP Office or the Area Frequency Coordinator for review is your decision and can be influenced by many different factors. Examples of instances in which it may be beneficial to contact the EMCAP Office include operations very close to shore (less than 50 miles), multi-ship missile exercises, and test events for new or modified equipment.

The EMCAP Team is always ready to review your EMCAP Plans and provide feedback prior to dissemination. Once you promulgate an EMCAP Plan naval message, the EMCAP Office reviews the received "info" copy of the message, and ensures it is current with the appropriate frequency regulations, laws, and treaties. It is our goal to ensure that you operate safely and compatibly at all times.

***Q: I just received EMCAP Version 5.0 and noticed I have two installation options. What is the difference between the "install software" option and the "install server" option? Which should I use?***

**A:** EMCAP 5.0 is designed for installation in one of two ways: 1) as a stand-alone application
2) as a file sharing application.

If the "install software" option is chosen, EMCAP is installed as a stand-alone application. All of the databases and software files are installed on the local computer. In this case, only one user at a time may execute EMCAP. This has been the only option for EMCAP installations prior to EMCAP 5.0.

If EMCAP is installed using the "install server" option, it can be executed as a file sharing application. This means that all of the EMCAP shared files such as databases, reference documents and National Imagery and Mapping Agency (NIMA) map data will be installed on a server. After installing the shared files on the server machine, the EMCAP software must then be installed on a computer accessible to the server via a network. Installing EMCAP with this option allows multiple users to utilize EMCAP and share its databases, documents and map data at the same time.

Only you can determine which type of installation best fits your needs, but in general, if only a single individual will need EMCAP, you should install EMCAP as a stand-alone application. To do this, click the "install software" option when the installation begins. However, if you think that multiple users will need to execute EMCAP or you would like to install the EMCAP databases and map data on a server, install EMCAP as a file sharing application by clicking the "install server" button during installation. You may need to contact your system administrator for installation of EMCAP's shared files on a server. Once the shared files are installed on the server, you will need to install the EMCAP software on a client computer. The client should have access to the server where the shared files are located. To install the EMCAP software on the client computer, use the setup.exe file located in the Netsetup directory on the server. This directory was created when the EMCAP shared files were installed on the server computer. See the Readme.txt file located on the EMCAP 5.0 Disc 1 compact disc (CD) for a complete set of installation instructions.

# NATO Special Working Group 10 Frequency Management

Photographs provided by CDR D. Engelhardt, FGN

The NATO Naval Armaments Group (NNAG) Special Working Group 10 (SWG/10) is involved in investigation and resolution of electromagnetic interference (EMI) and is responsible for providing the frequency management software tool NATO Electromagnetic Operational Programme for Radar, or NEOP-RADAR, to SWG/10 member navies. NEOP-RADAR Version 5.0 was recently provided to SWG/10 members.

NNAG SWG/10 members have conducted national trials of the NEOP-RADAR version 4.1 software. The Federal German Navy has adopted NEOP-RADAR as their country's official tool for radar system EMI analysis. CDR Dieter Engelhardt is a German representative to NNAG SWG/10 and has provided useful feedback to the NEOP-RADAR team. The results of the national trials, questions about possible enhancements to the software tool, and other EMI-related topics were discussed at recent SWG/10 meetings, which were held in San Diego, CA, during 28-30 January 2002, and in Brussels, Belgium, 11-13 September 2002. Pictures of SWG/10 members and guests at the January 2002 meeting in San Diego are shown to the left.

# Where in the World is Diego Garcia?

The EMCAP Version 5.0 and AESOP Version 0.5 software was expanded to include additional areas of operations such as the Indian Ocean region with Sri Lanka and Diego Garcia; the Mediterranean Sea region with Barcelona, Valencia, Cannes, Corsica, Crete, Rome, Sardinia, and Tel Aviv; in addition to the Baltic Sea, Gulf of Mexico, Pacific Northwest, Hawaiian Islands (except Kauai) and Kauai as new subregions. These new regions and subregions are accompanied by new and revised littoral restrictions based upon radiation restrictions and littoral guidance issued by the numbered fleet commands, the National Telecommunications and Information Administration (NTIA), and other sources. These radiation restrictions were developed in order to avoid electromagnetic interference (EMI) from naval radars to authorized shore-based receivers. The EMCAP Plan contains frequency assignments that adhere to the radiation restrictions, littoral guidance for the specific geographic area, and a summary of the radiation restrictions. Also, the source documentation for each radiation restriction is listed in the references section of the EMCAP Plan.

The radiation restrictions incorporated in the current software release are published in Revision 3 of the technical reference manual, known as OP-3840. Chapter 11 of OP-3840 Rev 3 includes tables of geographic regions/subregions, radiation restrictions for each region, radiation restrictions for each radar, and guardband restrictions, plus region-specific operational guidance. OP-3840 Rev 3 was distributed with the software and may be accessed through the Help menu or directly from the EMCAP/AESOP installation compact disc (CD). The current radiation restrictions are also available through the software's Help menu. New radiation restrictions have been released for the Fifth Fleet Area of Responsibility (AOR), please see "EMCAP Version 5.0 Update - New Arabian Gulf Restrictions" on page 15 for details on obtaining the updated restrictions.

A compilation of the source documentation for the radiation restrictions is included on the installation CD in a portable document format (MessageReferences.pdf) with bookmarks. The NTIA manual in ".pdf" is also included on the installation CD.

The selection of region and a related subregion, plus the closest distance from land on the Area of Operations page on the Phase Properties dialog in the EMCAP/AESOP software, determines the radiation restrictions (both systems' restrictions and guardband restrictions) that will be enforced during the frequency assignment process. For example, if an Aegis destroyer is operating within 45 nautical miles (nm) from Bahrain or Qatar in the Central Arabian Gulf, the AN/SPS-67 will be assigned a frequency below 5700 MHz and the AN/SPY-1 can operate on bands 1-4, low power only. However, if a closest distance from land of 55 nm was entered instead of 45 nm, then the AN/SPS-67 can be assigned a frequency anywhere in its tuning range (5450-5825 MHz) and the AN/SPY-1's assignment is expanded to bands 1-6 with either high or low power. Furthermore, if closest distance from land is beyond 100 nm in this area, then there are no radiation restrictions on any of the radars on the Aegis destroyer.

If the battle group frequency coordinator is tasked to construct an EMCAP Plan that is applicable to several geographic areas and closest distances to land, then the multiple phase capability of the software can be used. Each phase represents one combination of a region/subregion and closest distance to land. For example, a two-phase EMCAP Plan can be generated for the KENNEDY/WASP Battle Force that is transiting from the coast of Jacksonville, FL, to a Puerto Rican operational area. During the planning phase, Joint Frequency Management Office Atlantic (JFMOLANT) advises the battle group frequency coordinator that a frequency guardband out to 25 nm has been imposed in the 400-425 MHz range. The frequency coordinator constructs the Jacksonville phase with a closest distance to land of 10 nm with the new guardband, and the Puerto Rican phase with a closest distance to land of 55 nm. Once all the platforms have been inserted and other planning factors (adjustments to ship inventory, pre-assigned AN/SPN-41 channels, platforms' positions, propagation mode, terrain data, and environment data) have been input, the frequency coordinator can generate assignments and the EMCAP Plan. For multiple phase operations, the EMCAP/AESOP software will ensure compliance with all radiation restrictions, adhere to pre-assigned or permanent frequency assignments, maximize electromagnetic compatibility, and minimize phase-to-phase changes to a radar's frequency assignment in order to reduce unnecessary re-tuning of the radars.

In addition to the frequency assignments and operational guidance, the EMCAP Plan contains a paragraph that summarizes the radiation restrictions enforced in the EMCAP Plan. Through the use of message options, individual EMCAP Plans can be generated for each phase, or a single EMCAP Plan that encompasses all phases can be created. In addition, the frequency coordinator can generate phase reports that include all planning factors for each phase.

# *Afloat Spectrum Management Initiative . . .*

## Indoctrination

As part of the Afloat Spectrum Management (SM) Initiative, a set of briefings has been developed to indoctrinate battle group staffs with the revised spectrum management process that combines the communications planning and radar frequency coordination into a single process supported by the Afloat Electromagnetic Spectrum Operations Program (AESOP). The initial release of AESOP, Version 0.5, is a single installation compact disc (CD) containing Communication Planning Module (CPM) 6.1 and Electromagnetic Compatibility Analysis Program (EMCAP) 5.0. Copies of the AESOP 0.5 installation CD were delivered to the Fleet Information Warfare Center (FIWC), Little Creek, VA, and FIWC DET San Diego, CA, for re-distribution to the deploying battle group spectrum managers.

The set of Afloat SM Initiative briefings consists of an overview brief of the proposed Afloat SM Initiative, a brief highlighting the communication and radar planning processes and how the processes can be integrated into a single process using AESOP, and an EMCAP Hot Spots brief. The Hot Spots brief contains an analysis of the battle group's residual electromagnetic interference (EMI) in the expected area of operations, the littoral restrictions, potential EMI victims, and suggestions to mitigate the effects of residual EMI. The set of Afloat SM Initiative briefings has been inserted into the battle forces' D-30 schedule in order to train the deploying battle group in the revised process and the spectrum management tools available for frequency management.

During the fall of 2002, the Afloat SM Initiative and AESOP was briefed to several battle groups. FIWC at Little Creek, VA, hosted training for Cruiser Destroyer Group Eight; Amphibious Squadron Eight; USS THEODORE ROOSEVELT Carrier Battle Group (CVBG); and USS SAIPAN Expeditionary Strike Group (ESG). The FIWC Det at San Diego, CA, hosted Afloat SM Initiative training and AESOP training for Cruiser Destroyer Group One; Cruiser Destroyer Group Five; USS CONSTELLATION CVBG; USS NIMITZ CVBG; USS TARAWA Amphibious Readiness Group (ARG); and USS CARL VINSON CVBG. At Tactical Training Group Pacific (TACTRAGRUPAC), San Diego, the overview and combined processes were presented to provide indoctrination and training in the Afloat SM Initiative, the AESOP software, and to deliver a copy of AESOP 0.5 to USS CARL VINSON CVBG staff.

Early in 2003, Afloat SM Initiative training was offered to Cruiser Destroyer Group Twelve and USS ENTERPRISE CVBG. Future plans include a visit to Japan to provide Afloat SM Initiative training for Seventh Fleet personnel. Candidates for training include Carrier Group Five; USS KITTY HAWK CVBG; Amphibious Group One; Amphibious Squadron Eleven; and USS ESSEX ARG.

As each battle group is introduced to the new process associated with the Afloat SM Initiative and trained with the spectrum management tools provided by the AESOP software, feedback on the process and software is solicited. Suggestions for enhancements and new features may be sent to the addresses listed on page 2.


# EMCAP Version 5.0 Update - New Arabian Gulf Restrictions

In November 2002, after the release of EMCAP 5.0, the existing *Radar and Communications Restrictions within COMUSNAVCENT/ COMFIFTHFLT AOR, Arabian Gulf, 011246ZAUG02* was canceled and replaced by new set of radar and communications restrictions for the Arabian Gulf. A new EMCAP 5.0 database with the updated restrictions may be obtained via secure email from the Executive Coordinator (see page 2). Please consult the following paragraph in order to update system restrictions when acting as an EMCAP Frequency coordinator.

**Arabian Gulf Radar Restrictions Update as of 27 Nov 2002**

AN/APS-145: no change. AN/SPN-43C: Within 50 nautical miles (nm) of Bahrain, Qatar, and United Arab Emirates (U.A.E.) radiation is not permitted, elsewhere radiation permitted on channels 12-21. AN/SPS-40: Within 50 nm of Bahrain, Qatar, and U.A.E. radiation is not permitted, elsewhere radiation permitted on channels 1, 2, 8, 9, and 10. AN/SPS-49: In Bahrain, Qatar, U.A.E., Gulf of Oman, radiation permitted on channels LOW 1 to 16, MID 1 to 4, and HIGH 5 to 11. In Kuwait, radiation permitted on channels LOW 1 to 11, MID 1 to 4, and HIGH 5 to 11. AN/SPY-1: Within 25 nm of Bahrain, Qatar, U.A.E. and Kuwait radiation is not permitted. Between 25 and 50 nm of Bahrain, Qatar, U.A.E. and Kuwait radiation is permitted on bands 1 to 4 low power only. When operating outside of 50 nm from Bahrain, Qatar, U.A.E., Kuwait or anywhere in the Gulf of Oman radiation is permitted on bands 1 to 7 high and low power.

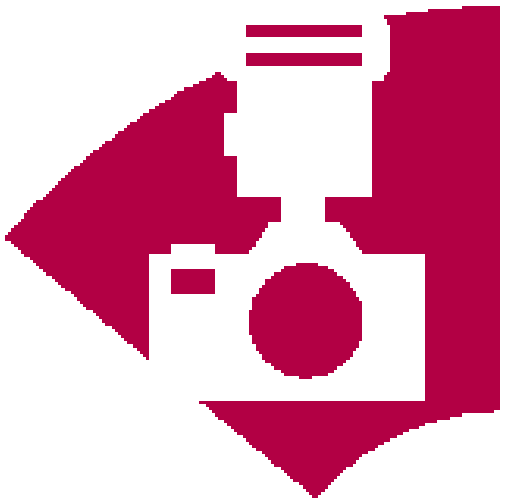
# YEARBOOK

## FLEET SUPPORT

The Space and Naval Warfare Systems Command (SPAWAR) team provides awareness briefings and operational support to the ashore and afloat fleet users of various software tools. These tools are the Communications Planning Module (CPM), the High Frequency Propagation Module (HFM), Joint Terrain Analysis Program (JTAP) and the Electromagnetic Compatibility Analysis Program (EMCAP).

For users of these tools, the team gives instruction in the execution of the software and describes how the output from each module is used in day-to-day communications planning or radar frequency management. Each of these modules assists in a variety of functions. CPM provides fleet communications planners with an automated method of developing comprehensive battle group communications plans in Allied Planning Publication 4 (APP-4) OPTASK COMM format. The HFM, available as a part of CPM and as a stand-alone tool, aids in determining frequencies to be used for long-haul communications by automating the high-frequency propagation predictions formerly available only in publication form [Navy Telecommunications Publication 6 Supplement 1 (NTP-6 SUPP-1)]. JTAP allows the overlay of transmitters/receivers on a plot of tactical terrain data, providing the user with various information such as elevation, path loss, received power, or field intensity.

For users of EMCAP, the team provides two products to its fleet users: the SPAWAR E9407-AA-GYD-010/(S) OP-3840 "Electromagnetic Compatibility Criteria for Surface Weapon Systems (U)" and the EMCAP software. OP-3840 is distributed on the EMCAP compact disc (CD) and can be installed on your hard drive. It provides background information, criteria, littoral restrictions and compatibility guidance for minimizing electromagnetic interference (EMI) to radars and weapon systems. The EMCAP software is a computer program that automates the complex compatibility criteria found in OP-3840 and generates an EMCAP frequency assignment plan in Turbo Prep and Message Text Format (MTF) as well as OPSTAT Unit messages. The EMCAP team provides fleet support sessions on the radar/weapon system frequency coordination process and EMCAP's role in that process.



The briefings provided by the team benefit both the software users and the team members. The users gain valuable knowledge on how to manage their frequency assets and the tools to perform the task. The team acquires vital information on fleet requirements, practices, and EMI experiences. These sessions are tailored to meet the needs of the requesting ship or shore activity. Meetings between users and the team representatives are highlighted on the following pages.

# EMCAP TRAINING . . .

## AEGIS TRAINING AND READINESS CENTER
## DAHLGREN, VIRGINIA

The EMCAP team provides two levels of briefings to students at the Aegis Training and Readiness Center (ATRC). The members of the Prospective Commanding Officer/Prospective Executive Officer (PCO/PXO) course receive a high-level overview of frequency management, emphasizing the role of EMCAP and OP-3840. The students in the Aegis Weapon System (AWS), Combat Systems Officer (CSO) and Combat Systems Maintenance Manager (CSMM) courses - who, in addition to the CSO and CSMM, may include the Air Defense Officer (ADO), Assistant Officer in Charge (AOIC), Assistant Operations Officer (AOPS), Anti-Submarine Warfare (ASW), Assistant Weapons Officer (AWEPS), Air Warfare Officer (AWO), Chief of Engineering (CHENG), Combat Information Center Officer (CICO), Electronics Material Officer (EMO), Electronic Warfare Officer (EWO), Fire Control Officer (FCO), Navigator (NAV), Operations Officer (OPS), Strike Officer (STRIKE), Systems Test Officer (STO), Training Officer (TRO), and Weapons Control Officer (WCO) - participate in an in-depth study of EMCAP and the responsibilities of the frequency coordinator. The EMCAP team has also provided briefings to Japanese and Spanish representatives who have attended training at the ATRC. There is a wealth of information exchanged in these briefings. Many of the ideas and recommendations from the students are used to improve and enhance EMCAP's products. All of the students listed in the following pages have contributed to the on-going success of EMCAP. EMCAP thanks the staff at the ATRC for allowing the EMCAP team to bring frequency management awareness to the Aegis community. Class participants are shown in the pictures on the following pages and represent various shore commands and the following U.S. ships:

| | |
|---|---|
| CG 47 | USS TICONDEROGA |
| CG 48 | USS YORKTOWN |
| CG 49 | USS VINCENNES |
| CG 50 | USS VALLEY FORGE |
| CG 51 | USS THOMAS S GATES |
| CG 52 | USS BUNKER HILL |
| CG 53 | USS MOBILE BAY |
| CG 54 | USS ANTIETAM |
| CG 55 | USS LEYTE GULF |
| CG 56 | USS SAN JACINTO |
| CG 57 | USS LAKE CHAMPLAIN |
| CG 58 | USS PHILIPPINE SEA |
| CG 59 | USS PRINCETON |
| CG 60 | USS NORMANDY |
| CG 61 | USS MONTEREY |
| CG 62 | USS CHANCELLORSVILLE |
| CG 63 | USS COWPENS |
| CG 64 | USS GETTYSBURG |
| CG 65 | USS CHOSIN |
| CG 66 | USS HUE CITY |
| CG 67 | USS SHILOH |
| CG 68 | USS ANZIO |
| CG 69 | USS VICKSBURG |
| CG 70 | USS LAKE ERIE |
| CG 71 | USS CAPE ST GEORGE |
| CG 72 | USS VELLA GULF |
| CG 73 | USS PORT ROYAL |
| DDG 51 | USS ARLEIGH BURKE |
| DDG 52 | USS BARRY |
| DDG 53 | USS JOHN PAUL JONES |
| DDG 54 | USS CURTIS WILBUR |
| DDG 55 | USS STOUT |
| DDG 56 | USS JOHN S MCCAIN |
| DDG 57 | USS MITSCHER |
| DDG 58 | USS LABOON |
| DDG 59 | USS RUSSELL |
| DDG 60 | USS PAUL HAMILTON |
| DDG 61 | USS RAMAGE |
| DDG 62 | USS FITZGERALD |
| DDG 63 | USS STETHEM |
| DDG 64 | USS CARNEY |
| DDG 65 | USS BENFOLD |
| DDG 66 | USS GONZALEZ |
| DDG 67 | USS COLE |
| DDG 68 | USS THE SULLIVANS |
| DDG 69 | USS MILIUS |
| DDG 70 | USS HOPPER |
| DDG 71 | USS ROSS |
| DDG 72 | USS MAHAN |
| DDG 73 | USS DECATUR |
| DDG 74 | USS MCFAUL |
| DDG 75 | USS DONALD COOK |
| DDG 76 | USS HIGGINS |
| DDG 77 | USS OKANE |
| DDG 78 | USS PORTER |
| DDG 79 | USS OSCAR AUSTIN |
| DDG 80 | USS ROOSEVELT |
| DDG 81 | USS WINSTON S CHURCHILL |
| DDG 82 | USS LASSEN |
| DDG 83 | USS HOWARD |
| DDG 84 | USS BULKELEY |
| DDG 85 | USS MCCAMPBELL |
| DDG 86 | USS SHOUP |
| DDG 87 | PCU MASON |
| DDG 88 | USS PREBLE |
| DDG 89 | PCU MUSTIN |
| DDG 90 | PCU CHAFEE |
| DDG 91 | PCU PINCKNEY |
| DDG 92 | PCU MOMSEN |
| DDG 93 | PCU CHUNG-HOON |

**CSMM Course, 28 January 2002**

Pictured left to right are ENS Tom Cavanagh, STO (DDG 57); FCC(SW) Charles R. Howett, CSMM (CG 71); FCCS(SW) Timothy J. Sheridan, CSMM (DDG 89); STGCM(SW) Anthony L. Wedo, CSMM (DDG 86); FCCS(SW) Christopher A. Dietrick, CSMM (DDG 90).

**CSO Course, 31 January 2002**

Pictured left to right are ENS Gilberto Mendiola, EMO (DDG 89); LT Tim Wyse, CSO (DDG 88); LTjg Ryan A. Conjar, CICO (DDG 87); LTjg Sean Ryker, FCO (CG 65); LT Angel Cruz, CHENG (CG 69); LCDR Carlos Barbosa, Aegis Test Officer, SUPSHIP PASCAGOULA MS. Not pictured are LT Bryan Carmichael, CHENG (CG 68); CWO2 Joseph Richards, STO (DDG 81).

**CSO Course, 8 February 2002**

Pictured left to right are LTjg Mike Ball, FCO (CG 61); LT Thomas Dixon, CHENG (DDG 54); LTjg Mark J. Kaul, CICO (DDG 62); LTjg Mark Downs, AOPS (DDG 52); LT Jennifer Ellinger, OPS (DDG 73); LTjg Jason Labott, FCO (DDG 67); LT Grant Dunn, CHENG (DDG 62); LTjg Neely Marcus, FCO (CG 60); LTjg Elisia George, TRO (DDG 55); LT Dennis Velez, OPS (CG 64); LT Jacob Gutierrez, WCO (DDG 61); LTjg Wayne Gayle, CICO (DDG 54); CWO2 Charles Tipton, STO (DDG 70); LTjg Robert S. Smith, FCO (DDG 72); LTjg Elizabeth Ann Wicht, CICO (DDG 66).

**CSO Course, 14 February 2002**

Pictured left to right are LTjg Paul R. Henry, FCO (CG 50); LT Lawrence E. Gonzales, CHENG (CG 49); LTjg Kevin Canty, FCO (CG 48); LTjg Joseph Hayes, FCO (CG 47); LT Tracy G. DeWitt, WCO (CG 51); LT Kenneth Nielsen III, WCO (CG 58); LT Stephen C. Davis, CHENG (CG 53); LTjg Kelly A. Kennedy, FCO (CG 56); LTjg Brian Bradshaw, CICO (CG 47); LTjg Stefanie Aarthun, CICO (CG 53); LCDR James E. Kirby, CHENG (CG 58).

**PCO/PXO Course, 20 February 2002**

Pictured left to right are LCDR Keith Wheeler, PXO (DDG 57); CAPT Glenn Flanagan, PCO (CG 61); CAPT Charles B. Dixon, PCO (CG 63); LCDR Shawn P. Duffy, PXO (DDG 52); LCDR Steve J. Coughlin, PXO (DDG 64); LCDR Jared Keys, PXO (CG 71). Not pictured is LT Jeannie Garcia, Instructor AEGIS TRAREDCEN DAHLGREN VA.

**CSO Course, 25 February 2002**

Pictured left to right are ENS Tom Cavanagh, STO (DDG 57); ENS Stephen R. Rose, EWO (DDG 58); LT Jon Duffy, OPS (DDG 60); LTjg Michael Otto, AOIC, AEGIS TRAREDCEN DET YOKOSUKA JA; LTjg S. D. Trulove, FCO (DDG 74); ENS Michael Russell, CICO (DDG 71); LTjg K. C. Schlachter, FCO (DDG 71); LTjg Jill Robertson, CICO (CG 67); LT Mark D. Grob, CHENG (DDG 58); LTjg Amber Bonadio, FCO (DDG 77); LTjg C. N. Fuentes, TRO (CG 70); LT Allen Adkins, WCO (CG 67); LTjg P. F. Fischer, CICO (DDG 56); LT B. D. Juhl, OPS (DDG 59).

**CSMM Course, 11 March 2002**

Pictured left to right are FCCS Edmund N. Boilard, CSMM (CG 49); ENS Robert M. Johnson, EMO (CG 67); ENS Gary L. Pray, EMO (CG 52); FCC Robert S. Herr, CSMM (DDG 51); LT Kevin Peters, STO (CG 60); ENS Jaime Sigala, STO (DDG 71); ENS Kerri L. Holm, EMO (DDG 79).

**CSO Course, 14 March 2002**

Pictured left to right are LTjg Andrew Fichter, CICO (CG 60); LTjg Michael B. Rose, FCO (DDG 54); LT Jay D. Wylie, OPS (CG 73); LTjg Lisa R. Sickinger, CICO (DDG 55); LT Mark W. McCulloch, CHENG (CG 64); CWO2 Larry W. Sharp, CICO (CG 73); LTjg Wallace Frazier, CICO (DDG 64); LTjg Scott A. Regenerus, CICO (DDG 74).

**CSO Course, 3 April 2002**

Pictured left to right are CWO2 Rudy P. Mendiola, EMO (CG 71); LTjg Brock Fanning, ASW (DDG 87); ENS Kristen Riismandel, TRO (DDG 82); LTjg Ben King, CICO (DDG 82); LT John Cranston, CSO (DDG 90); LTjg S. A. Herschkowitz, FCO (DDG 89); LT Brian Deters, AOIC, AEGIS TRAREDCEN DET SAN DIEGO CA; LTjg Jamie Davidson, NAV (DDG 82); CWO2 Carl J. Scavo, CICO (DDG 90); ENS Nick Horvath, CICO (DDG 89); LT Al Johnson, CHENG (DDG 89); LT Joe Femino, OPS (DDG 79); LT J. L. Meyers, Jr., CSO (DDG 89); LTjg Michael Gruell, FCO (DDG 83).

**CSO Course, 4 April 2002**

Pictured left to right are LT Ray Rivera, WCO (CG 49); LCDR Marty Rodriguez, CHENG (CG 57); LT Joseph Carrigan, OPS (CG 57); LTjg Sean Linnehan, TRO (CG 47); ENS Robert Biggs, CICO (CG 53); LTjg Rob Almeida, TRO (CG 54); LTjg Colby H. Miller, FCO (CG 52); LTjg Robert Lightfoot, FCO (CG 54); LTjg Kristin Swedenburg, CICO (CG 54). Not pictured is LCDR Marc Scotchlas, CHENG (CG 54).

**CSO Course, 5 April 2002**

Pictured left to right are LT Steven Dutter, CHENG (DDG 74); LT Philip Engle, CSO, COMDESRON TWO; LTjg David C. Leiker, FCO (DDG 75); LT Curtis S. Calloway, CHENG (DDG 52); ENS Chad M. Hamm, CICO (DDG 61); ENS Shawn Devlin, TRO (DDG 65); LTjg Gustave Yohner, CICO (DDG 63); ENS Alfred Stanley, AOPS (DDG 56); LT Douglas E. Kennedy, WCO (DDG 56). Not pictured is LT Rod Woodward, CSO (DDG 53).

**CSMM Course, 17 April 2002**

Pictured left to right are FCC Michael Medina, CSMM (DDG 60); ENS Leonard Gonzales, EMO (DDG 72); CWO2 Brian S. Newby, STO (DDG 65); ENS Adam C. Morgan, STO (CG 54); ENS John Bard, EMO (DDG 58); LT Bill Hays, STO (DDG 54); FCC Scott C. Smith, CSMM (CG 65); FCC David W. Nelson, Instructor, AEGIS TRAREDCEN DET YOKOSUKA JA; FCCS(SW) Joe Hawkins, FTSCLANT DET MAYPORT FL.

**PCO/PXO Course, 22 April 2002**

Pictured left to right are Mr. Rufinido Baltazar, NAVSURFWARCENDIV PORT HUENEME CA; LCDR Tom Druggan, PXO (DDG 82); CDR Pat Piercey, PCO (DDG 83); CDR Denny Wetherald, PCO (DDG 82); LCDR David M. McFarland, PXO (DDG 84); CDR Yvette C. Brown Wahler, PCO (DDG 90); LCDR Pete Galluch, PXO (DDG 89); LCDR Robert D. Katz, PXO (CG 59).

**CSO Course, 26 April 2002**

Pictured left to right are LT Mark Ferrara, CICO (DDG 73); LTjg Kevin Jackson, FCO (CG 72); LT Thomas Shultz, CHENG (DDG 73); ENS Adam Thompson, CICO (DDG 60); LT Lou Sanchez, WCO (DDG 66); ENS Keith R. Luckett, CICO (DDG 69); LTjg James W. Hedderly, FCO (DDG 60); LT Todd Boehm, CHENG (CG 72); LTjg Jennifer L. Gillooly, CICO (DDG 71); ENS Michael J. Spangler, CICO (DDG 55); LT Stacey Yopp, CHENG (DDG 56); LTjg Danielle Sachtleben, TRO (DDG 66); LT Christopher F. Cigna, CSO (DDG 51); LT Edward J. Schweighardt, WCO (DDG 55); LT Rick Trevisan, CHENG (DDG 72).

**PCO/PXO Course, 7 May 2002**

Pictured left to right are CDR Ron Boxall, PCO (DDG 64); CDR Don Schmieley, PCO (DDG 57); CDR Clay Harris, PCO (DDG 51); CDR Chris Grady, PCO (DDG 67); CDR Mike Viland, PCO (DDG 77); LCDR Joe Darlak, PXO (DDG 63); LCDR Cary Krause, PXO (DDG 78); LCDR Mark Andersen, PXO (DDG 54); LCDR John Banigan, PXO (DDG 59).

**CSO Course, 17 May 2002**

Pictured left to right are LTjg Michael Green II, FCO (DDG 85); LT Michael Elliott, WCO/CSO (DDG 81); LTjg Keith Haines, CICO (CG 66); LTjg Leah Haas, TRO (DDG 58); LTjg Zach Ellis, CICO (DDG 89); LT Shane Morton, WCO (DDG 87); ENS Derryk Walterman, AOPS (CG 68); LCDR Robert Macky, CHENG (DDG 84); LTjg Mike Wasilewski, CICO (DDG 83); LTjg Larry Green Jr., CICO/AOPS (DDG 80); LT Matthew Jerbi, OPS (DDG 89); LTjg Mical Crumbly, STRIKE (DDG 87). Not pictured is LT Sylvester Steele, OPS (DDG 80).

**PCO/PXO Course, 22 May 2002**

Pictured left to right are LCDR Mike Feyedelem, PXO (CG 50); CAPT Tom McGuire, PCO (CG 55); CAPT G. J. Fullerton, PCO (CG 54); LCDR Joe Huffaker, PXO (CG 47); LCDR Rob Morrison, PXO (CG 56); CDR Patrick Rabun, PCO (CG 50).

**CSO Course, 3 June 2002**

Pictured left to right are LTjg Jonathan Oakey, AOPS (DDG 69); LT Paul Wingeart, WCO (CG 70); LT Amy Bleidorn, WCO (DDG 63); ENS Randall Stine, CICO (DDG 53); LTjg Luc Delaney, FCO (CG 73); LT Etta "CJ" Jones, CHENG (CG 61); LT Stewart Bateshansky, WCO (DDG 69); LTjg Wayne Liebold, CICO (DDG 62); LTjg Dan Stamper, FCO (DDG 65).

**CSMM Course, 19 June 2002**

Pictured left to right are FCC(SW) Dan E. Kryling, CSMM (DDG 76); FCC(SW) Michael P. McEneaney, AWS (CG 52); FCC(SW) Kevin R. Provencher, CSMM (CG 68); ENS Timothy H. Proctor, STO (CG 73); ENS Santoya A. Brown, EMO (CG 49); FCC(SW) Michael Lamb, CSMM (DDG 71); ENS Stephen A. Turner, EMO (CG 61); FCCS(SW) Scott Ruhle, CSMM (DDG 69). Not pictured is FCC(SW) Clifford Sandy, Instructor, AEGIS TRAREDCEN DAHLGREN VA.

**CSO Course, 21 June 2002**

Pictured left to right are ENS Darvin F. Robinson, STO (CG 51); LTjg Desmond Victor, CICO (CG 57); LTjg Robert Hochstedler, AOPS (CG 52); LTjg Leroy Mitchell, TRO (CG 55); LTjg Adam Lewis, TRO (CG 53); LT Joey Frantzen, WCO (CG 50); LTjg Stephen C. Shirley, TRO (CG 49); LT Krist Norlander, WCO (CG 57).

**CSO Course, 21 June 2002**

Pictured left to right are LTjg Anthony L. Webber, FCO (DDG 63); LTjg Stacey L. Brown, TRO (CG 67); LTjg R. V. Gonzales, CICO (DDG 70); LT Kevin Johnson, OPS (DDG 54); LTjg Karen Li-Patterson, FCO (CG 62); LT Michael O'Driscoll, CHENG (DDG 67); LTjg Jason Cooper, TRO (DDG 73); LT David Fowler, OPS (DDG 74); LTjg V. F. Righter, CICO (DDG 60); LTjg W. Bryan Breeden, CICO (DDG 53); LTjg Richard L. Servance, CICO (CG 73); LT Nathan Strandquist, WCO (DDG 75).

**CSO Course, 28 June 2002**

Pictured left to right are LTjg Taryn Brady, TRO (CG 59); ENS Patrick Pierson, ADO (CG 71); LTjg Keith Manning, FCO (CG 66); LT Todd Zirkle, WCO (DDG 81); LTjg John Lukacs, CICO (CG 68); LT George Kessler, WCO (DDG 89); LTjg Duke Louidor, TRO (CG 66); LT Charles Washington, CHENG (DDG 82); LT Brian Kosko, EMO (CG 59); LT B. Cardwell, STO (CG 71); LT Al Lopez, WCO (DDG 90); LT Joseph K. Hall, WCO (CG 69); LTjg Joshua Lewis, FCO (CG 69); LT Justin Kubu, WCO (DDG 82); LTjg Paul O'Brien, FCO (CG 59); CWO2 Richard Langley, STO (DDG 90).

**PCO/PXO Course, 2 July 2002**

Pictured left to right are LCDR Apgar, PXO (DDG 66); LCDR Edwards, PXO (CG 67); CDR John Mitchell, PCO (DDG 69); LCDR Pickard, PXO (CG 60); CDR Bill Kearns, PCO (DDG 59); LCDR Davids, PXO (DDG 76); CAPT Scott Anhalt, PCO (CG 70); CDR Thebaud, PCO (DDG 73); CAPT Hebner, PCO (CG 64); LCDR Cheeseman, PXO (DDG 72); CDR Campbell, PCO (DDG 56); CDR Charles Williams, PCO (DDG 63).

**CSO Course, 3 July 2002**

Pictured left to right are LTjg Sean Quirk, FCO (DDG 69); LT J. R. Flores, CHENG (CG 60); LTjg Allen Maxwell, Jr., FCO (DDG 59); LTjg Shellee Morris, CICO (CG 61); Mr. Remar Balatero, NAVSURFWARCENDIV CORONA CA; ENS Santos, AOPS (DDG 63); LTjg Holguin, FCO (CG 67); LT Sebastian, OPS (CG 67); LTjg Tryon, FCO (DDG 55).

**PCO/PXO Course, 16 July 2002**

Pictured left to right are LCDR Tim Callaham, PXO (DDG 79); CAPT Wayne Young, PCO (CG 66); CDR John Ailes, PCO (DDG 92); LCDR Brian Shipman, PXO (DDG 83); CDR Bob Byron, PCO (DDG 91).

**CSMM Course, 31 July 2002**

Pictured left to right are ENS Brian Peters, EMO (DDG 59); ENS Darvin F. Robinson, STO (CG 51); FCC(SW) Larry Kitchen, CSMM (DDG 64); FCC(SW) Daniel M. Bowen, CSMM (DDG 56); FCC(SW) Randall E. Black, CSMM (DDG 68); FCC(SW) Chaz W. Steinkuehler, CSMM (DDG 82); FCC(SW) Dan W. Dietzel, CSMM, FTSCLANT MAYPORT FL.

**CSO Course, 9 August 2002**

Pictured left to right are LTjg Michael Nix, TRO (DDG 58); LTjg John Hennigan, CICO (CG 65); LT John Thompson, WCO (DDG 68); LT Samantha Baldwin, WCO (DDG 79); LTjg James Cook, CICO (CG 62); LTjg Tony Tillmon, TRO (CG 60).

**CSMM Course, 28 August 2002**

Pictured left to right are FCC(SW) Michael K. Stump, CSMM (DDG 58); FCC(SW) Fred Whiteman, CSMM (DDG 79); FCC(SW) James Krogman, CSMM (DDG 81); FCC Wilmer, CSMM (DDG 73); CWO2 Willie Shazier, STO (DDG 91).

**CSO Course, 29 August 2002**

Pictured left to right are LTjg Troy Denison, TRO (CG 56); LT C. M. Perry, WCO (CG 47); LT J. J. Ring, WCO (CG 53); LT Thomas Garcia, WCO (CG 64); LTjg E. Monge, TRO (CG 48); LTjg M. A. Rice, CICO (CG 55); LTjg C. Steingrube, FCO (CG 51); LTjg S. Ehrlander, CICO (CG 50); LTjg Geoffrey Pagano, ADO (CG 56); LTjg N. M. Street, CICO (CG 52); LT Glen Deal, EMO (CG 48); LT A. Welter, OPS (CG 49). Not pictured are LTjg Peter Giambastiani, FCO (CG 57); LTjg D. Person, FCO (CG 53).

**CSO Course, 30 August 2002**

Pictured left to right are LT Robert L. Halfhill, Instructor, AEGIS TRAREDCEN DAHLGREN VA; LT Brent Carroll, OPS (DDG 69); LT Matt Evans, WCO (DDG 62); LT Lance Lantier, CHENG (DDG 69); LT Edward Newby, CHENG (DDG 70); LT Aristides Reyes, CHENG (DDG 73); LT Sean Boyle, WCO (DDG 56); LT Brian Mutty, OPS (DDG 67); LTjg Kristy Nistler, TRO (CG 73); LT Tommy Fifer, WCO (DDG 60); ENS Jeff McCrady, STO (DDG 60).

**PCO/PXO Course, 4 September 2002**

Pictured left to right are CDR Brad Mai, PCO (DDG 74); CAPT Pat Allen, PCO (CG 73); LCDR Bob Cepek, PXO (DDG 67); CAPT Joe Harris, PCO (CG 67); LCDR Sean Moriarty, PXO (DDG 61); CDR Karl Van Deusen, PCO (DDG 66); LCDR Matthew Fleming, PXO (DDG 77); LCDR Michael Junge, PXO (DDG 68); LCDR Jim Campbell, PXO (CG 61).

**CSO Course, 9 September 2002**

Pictured left to right are LTjg J. Parker, CICO (CG 69); LTjg J. Black, CICO (CG 71); LT J. Seigler, OPS (CG 65); LT C. Galloway, CHENG (DDG 90); LTjg C. Hood, AOPS (DDG 88); LTjg J. Chesnut, STRIKE (DDG 89); LTjg S. Babbitt, TRO (DDG 79); LT A. Ramirez, OPS (DDG 90); ENS D. Hamilton, STO (CG 66); LT M. Morrell, CHENG (DDG 91); LT D. Kuriger, OPS (DDG 82); LT B. Boycourt, OPS (DDG 83); LTjg A. T. Workman, FCO (CG 66); LCDR J. Wargi, SURFCOMBATSYSCEN WALLOPS ISLAND VA; LT K. Smith, NAVSURFWARCENDIV DAHLGREN VA; LTjg B. Coletti, AOPS (DDG 85). Not pictured is LT P. Foster, OPS (DDG 91).

**CSO Course, 20 September 2002**

Pictured left to right are LTjg Josh Stewart, CICO (CG 63); LTjg Shawn T. Singletary, TRO (DDG 71); LTjg Sarah E. Zarro, FCO (DDG 52); LT Andrew Chicoine, CHENG (DDG 51); LT Frank Kremer, EMO (CG 62); LT Paul R. Darling, WCO (DDG 70); LT Jim Hamilton, CSO, COMCRUDESGRU EIGHT.

**PCO/PXO Course, 25 September 2002**

Pictured left to right are LCDR Fred Sheehy, PXO (CG 53); CDR Rich Rainer, PCO (CG 51); LCDR Goodnight, PXO (CG 52).

**CSMM Course, 9 October 2002**

Pictured left to right are FCC D. R. Holley, CSMM (CG 63); CWO2 Dave Montgomery, EMO (DDG 71); LTjg Jeff A. Brooks, EMO (DDG 92); FCC Brannon, LCPO, AEGIS TRAREDCEN DAHLGREN VA; FCC Timothy Bowers, CSMM (DDG 92); LT Michael A. Dyer, EMO (DDG 64); FCC M. A. Dinyar, CSMM (CG 50); FCCS(SW) William Paul, CSMM (CG 47); FCC Christopher A. Blodgett, CSMM (DDG 75).

**AWS Course, 23 October 2002**

Pictured left to right are FC1 D. P. Wolvin, (CG 59); FC1 Jason Villanueva, AEGIS TRAREDCEN DAHLGREN VA; FC1 M. A. Rossi, (DDG 79); FC1 Robert L. Watson, (DDG 93); FCC Richard Jacobs, CSMM (CG 66); FC2 Andre A. Hopson, (DDG 93); FC1 Ken A. VanCamp, (DDG 79); FC1 John E. Ballard, (DDG 80); FC1 Frank Sudderth, ASW (DDG 81). Not pictured is FCC Kevin Provencher, CSMM (CG 68).

**CSO Course, 28 October 2002**

Pictured left to right are LTjg A. D. Matos, FCO (CG 68); LT Nicholie Bufkin, OPS (CG 68); LT J. C. Eaton, CHENG (CG 71); LTjg E. J. Pledger, TRO (DDG 90); LT Brad Stallings, CHENG (DDG 92); LTjg Thomas Snee, FCO (DDG 90); LTjg Richard A. Crawford, FCO (DDG 91); LTjg Dave Ryan, NAV (DDG 91); LTjg C. J. Schwarz, FCO (DDG 80); LTjg Ian Scaliatine, FCO (DDG 84); LTjg A. G. Baca, TRO (DDG 88); Mr. Andrew Palmer, Analyst, NAVSURFWARCENDIV CORONA CA.

**CSO Course, 1 November 2002**

Pictured left to right are LT Richard Rossetti, CSO (DDG 60); LTjg Roderick Magee, CICO (DDG 57); LT John Kochendorfer, CHENG (DDG 63); Ms. Laura Jennings, NAVSURFWARCENDIV DAHLGREN VA; LTjg Andrew Blackwell, CICO (CG 72); Ms. Amanda Marston, NAVSURFWARCENDIV DAHLGREN VA; ENS Stephen W. Drake, CICO (DDG 74); LTjg Mike Murphy, NAV (DDG 62); LTjg Robert McFarlin, AWEPS (DDG 61).

**PXO/PXO Course, 5 November 2002**

Pictured left to right are LCDR Heedong Choi, PXO (CG 70); LCDR Tim Weber, PXO (CG 73); LCDR Randy Hardy, PXO (DDG 51); LCDR Ed Devinney, PXO (CG 72); LCDR H. Thomas Workman, PXO (DDG 53); LCDR Jim Loper, PXO (DDG 55); CDR Roy Kitchener, PCO (DDG 53); LCDR Chuck Good, PXO (DDG 62).

**CSO Course, 18 November 2002**

Pictured left to right are LTjg Torres, FCO (CG 49); LT Alva, WCO (CG 56); LT Piatt, OPS (CG 58); LCDR Klaszky, CSO (CG 48); LTjg Grimes, CICO (CG 48); LTjg Fuller, CICO (CG 49).

**PCO/PXO Course, 21 November 2002**

Pictured left to right are LCDR C. A. Burkins, PXO (CG 66); CDR E. F. Kenyon, PCO (DDG 92); LCDR W. A. Bullard III, PXO (DDG 92); LCDR R. W. Bodvake, PXO (DDG 81); CDR Bob Barwis, PCO (DDG 84); LCDR A. L. Simmons, PXO (DDG 90).

**CSO Course, 22 November 2002**

Pictured left to right are LTjg Brusca, FCO (DDG 73); LT Tate Robinson, WCO (CG 63); CWO2 Wilson, CICO (DDG 72); LT Saegert, WCO (DDG 53); LT DuPont, OPS (DDG 68); LT Kawas, OPS (DDG 75); LT Littmann, WCO (DDG 52); LTjg Watkins, FCO (DDG 53); LTjg Jason Roberson, FCO (DDG 68); LT Brad Miller, WCO (CG 62); LTjg James Strickland, FCO (DDG 70); LTjg Dave Huljack, FCO (CG 63).

**CSO Course, 26 November 2002**

Pictured left to right are LT Michael Pfarrer, CSO (DDG 92); LT Tim Anderson, WCO (DDG 80); LTjg Tristan Wagner, STRIKE (DDG 91); LT Dave Back, WCO (DDG 91); LT Timothy 'Van' Cooke, WCO (CG 71); LT Elvis Mikel, WCO (CG 65); LT Craig A. Hill, OPS (CG 71); LT Antonio Martinez, WCO (DDG 92); LCDR Brian Willemssen, CSO (DDG 84); LT Tracy Maestas, OPS (DDG 92); LT Randy High, WCO (DDG 83); LT Mark Fegley, ENG (DDG 80); LT Wayne Goveia, CHENG (DDG 85); LT Kevin Austin, CSO (DDG 91). Not pictured is LTjg Jeffrey Brooks, EMO (DDG 92).

**CSMM Course, 11 December 2002**

Pictured left to right are FCC(SW) Douglas L. Callaway, CSMM, AEGIS TRAREDCEN WALLOPS ISLAND VA; LT James A. Rosser, STO (CG 53); FCC(SW) Jamison Meyer, CSMM (DDG 77); FCC(SW) Joseph J. Diak, CSMM (DDG 92); FCC(SW) Keith A. Welty, CSMM (DDG 61); ENS Jerry A. French, EMO (DDG 91); ENS Lonnie A. Easter, STO (CG 65); FCCS(SW) William M. Riceman, CSMM (CG 58).

# ALLIED TRAINING . . .

**Spanish CSMM Course, 10 January 2002**

Pictured left to right are SCPO Jose Antonio Jimenez Ceballos, CSMM, SPS ALVARO DE BAZAN (F 101); CPO Eduardo Garcia Chorat, CSMM (F 101); LT Jose Andres Freire Gato, CSMM, SPS ALMIRANTE JUAN DE BORBON (F 102); SCPO Ramon Manuel Prieto Salgado, SPY-1 (F 102); CPO Jesus Garcia Martinez, SPY-1 Tech (F 102); LTjg Andres Mosquera Beceiro, STO (F 102); CPO Andres Luis Ayan Grao, CSMM (F 101). Not pictured are William Miller, Instructor, AEGIS TRAREDCEN DAHLGREN VA; John H. Smith, Instructor, Lockheed Martin Corporation.

**Japanese CO/XO Course, 3 June 2002**

Pictured left to right are Mr. Art Wildes, Instructor, AEGIS TRAREDCEN DAHLGREN VA; LTJG Akito Tachiyama, Sasebo-S.R.S.F.; LCDR Hidenobu Kanda, 1st Service School Hiroshima; LTJG Sumitaka Matsuuchi, SSC.

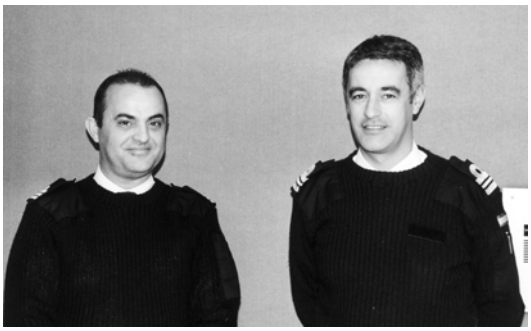
**Japanese CSO Course, 1 July 2002**

Pictured left to right are LTjg Akito Tachiyama, LCDR Hidenobu Kanda, and LT Sumitaka Matsuuchi.

**Spanish CSO Course, 18 September 2002**

Pictured left to right are LCDR Castelo, SPS ALMIRANTE JUAN DE BORBON (F 102); LT Hernandez (F 102); LTjg Juan Moreno (F 102); ENS Moreira, SPS ALVARO DE BAZAN (F 101); LTjg Fernando Munguia (F 102); LT Cuetos (F 102); LT Ricardo Gomez, Gunnery Officer (F102); LT Tomas Dolarea (F 102); LCDR Jose Garcia DeLomas (F 101); LT Cardona (F 102); LT Almira (F 102).

**Spanish CO/XO Course, 4 November 2002**



Pictured left to right are CDR Manuel Garat, CO, SPS ALMIRANTE JUAN DE BORBON (F 102); LCDR Antonio Pineiro, XO (F 102).

**Spanish CSMM Course, 3 December 2002**

Pictured left to right are ENS Jose M. Couce, FCO, SPS BLAS DE LEZO (F 103); SCPO Martin Patino, SPY-1 (F 103); CPO Fernando Cuina, ACNT, SPS ALMIRANTE JUAN DE BORBON (F 102); CPO Ovidio Vasquez, SPY-1 (F 103); LTjg Jose L. Porto, EMO (F 103); CPO Jorge Ramirez (F 102); CPO Juan A. Aleu (F 102).

**Japanese CSMM Course, 3 December 2002**

Pictured left to right are PO-3 Masaki Takeda, JDS KIRISHIMA (DDG 174); PO-3 Juta Watanebe, JDS MYOUKOU (DDG 175).

# TRAINING VISITS . . .

**AESOP Briefing on 27 August 2002 at FLTINFOWARCEN DET SAN DIEGO CA**

Attending were CTO1 John Doyle, USS BUNKER HILL (CG 52); LT Kurtis Mole, USS CONSTELLATION (CV 64); ENS G. A. Pfarr (CG 52). Attending from COMTHIRDFLT were CDR Steve Ashworth, EWCS Mark Ross, ITC Gary Vogel; from COMCARGRU SEVEN were LT Kyle Campbell, EWCM Kurt Worden, IT2 Sammy Palomo; from COMCRUDESGRU FIVE were CAPT Douglas Prince, LCDR William Hearther, LT Douglas Harbold, EWC Rick Monroe; from COMCRUDESGRU ONE were EWCS Paul Sigmon, IT1 Steven Shepski, IT2 William Henriquez, IT2 Sean Lewis; from FLTINFOWARCEN DET SAN DIEGO CA were CDR John Roseli, LTjg Raf Belliard, LTjg Marciel Urban, ENS Dane Berensen, EW1 Mark Jones, CTO1 Steve Reed, EW1 James Whitman, Mr. John Phillips, Mr. John Solt. Attending both the briefing and additional AESOP training were EW2 Michael Arrowsmith, USS TARAWA (LHA 1); EWC Daniel Bess, COMPHIBRON SEVEN; EWC Jon Bradsberry and EW1 Michael Green, FLTINFOWARCEN DET SAN DIEGO CA.

**EMCAP Training on 20 September 2002 at AEGIS TRAREDCEN DET PEARL HARBOR HI**

Pictured left to right are FC1(SW) Agripino Lujan, USS PORT ROYAL (CG 73); LTjg Luc Delaney (CG 73); FCC(SW) Louis E. Cole (CG 73); FCC Brett R. Hudson, COMAFLOATRAGRUMIDPAC PEARL HARBOR HI; FCC(SW) Daniel Tschida, USS RUSSELL (DDG 59); FCC(SW) Alfredo Pargas, AEGIS TRAREDCEN DET PEARL HARBOR HI; FCC(SW) Brian Wojcicki (DDG 59); FC2 Shawn Walker (DDG 59); FCC(SW) Michael Clairain, AEGIS TRAREDCEN DET PEARL HARBOR HI; EWCS(SW) John C. Hanselman, AEGIS TRAREDCEN DET PEARL HARBOR HI.

**AESOP Briefing on 10 October 2002 at FLTINFOWARCEN NORFOLK VA**

Attending were CTRSA Evan Chauvette, USS THEODORE ROOSEVELT (CVN 71); ITC John Lees, USS STUMP (DD 978); CTT2 Matt Morgan (CVN 71); OSCS Edwin Reedon, USCINCJFCOM NORFOLK VA; FCC Mark Taylor, USS WINSTON S CHURCHILL (DDG 81); CTT1 W. M. Williford (CVN 71); LT Todd Zirkle (DDG 81); Mr. Will Miles, ANTEON CORP. Attending from CINCLANTFLT NORFOLK VA were ITCS Charles Perkins, ITC Thomas Ziemba; from COMCRUDESGRU EIGHT were CDR Burke, LCDR Hanson, EWCS A. J. Redes, ITC Latrenda Falconer, IT1 Rechell Winfrey; from JFMO LANT NORFOLK VA were ITC Janet Baker, Mr. Hanssen; from FLTINFOWARCEN NORFOLK VA were LT C. J. Storey, CWO2 Marty Nemmers and CWO2 Pedro Roman.

**AESOP Briefing on 16 October 2002 at FLTINFOWARCEN DET SAN DIEGO CA**

Attending were ITC T. Albright, USS NIMITZ (CVN 68); LT Sean Anderson, USS RODNEY M DAVIS (FFG 60); EW2 Brendan Banks, USS FITZGERALD (DDG 62); IS1 Zirie Benton (DDG 62); EWC J. Brasser, USS PRINCETON (CG 59); LTjg Anthony J. Chiles (CVN 68); EW1 C. G. Clement (DDG 62); EW1 Arthur Ebert (FFG 60); CWO2 L. G. Falkenhusen (CG 59); EWC Mike Henton (CVN 68); EW2 Gregory Juday (DDG 62); LT J. T. Kane, USS CHOSIN (CG 65); EW1 Stephen Lacour (DDG 62); LTjg Voncile McQueen (CVN 68); ENS Ben J. Miller (FFG 60); EWC Byron Myers (CVN 68); EW1 Andre L. Pless, USS OLDENDORF (DD 972); EW2 Kelley Pullen (CVN 68); EWSN James Richardson (DDG 62); EWC(SW) Vic L. Rivera (DD 972); EW2 Jake Scott (CVN 68); EW2 R. O. Supulveda, USS BENFOLD (DDG 65); EW1 G. E. Walter (CG 65); EWC D. Richard, COMCARGRU ONE. Attending from COMCRUDESGRU FIVE were LCDR Barbara Lopez, LT Doug Harbold, EWC Rick Monroe, IT1 Jerrulld Lemelly. Attending from FLTINFOWARCEN DET SAN DIEGO CA were LCDR J. D. Morrison, EWCS Earl Deas, EWC(SW/AW) James J. Butterworth, EWC Justin Hansen, EW1 James Q. Whitman, EW2 Stephen J. Pinell and Mr. John Miller.

**AESOP Briefing on 23 October 2002 at TACTRAGRUPAC SAN DIEGO CA**

Attending were CAPT W. Geiri, CDR Malloy, LCDR Houchin, and EWC Shuey from COMCARGRU THREE; EWC Hanson and EW2 Pinnell from FLTINFOWARCEN DET SAN DIEGO CA.

**Across**

1. Stores
4. Sea
6. Maniac
9. Tee
11. Phantom
13. Lotion
14. Stock
16. No
19. Asps
21. Tectonics
22. Ape
24. Hose
26. Fro
27. Oar
29. Mom
32. Pear
33. Halogen
34. Fluke
35. Like
36. Police
37. Glen
39. Crook
40. Silo
41. One
42. Poi
46. Gala
48. Ate
50. Also
51. Ill
52. Terrain
53. Cut
54. Candles
55. Crown

**Down**

1. Stylish
2. Ovation
3. Shank
4. Sat
5. Age
7. Isthmus
8. Cumbersome
10. Electromagnetic
12. Spectrum
15. Arm
17. Coupe
18. Art
19. Bus
20. Archipelago
23. Karma
25. Pool
28. Shackle
30. Ring
31. Monitor
33. Function
38. Hypochondriac
43. Navigation
44. Tag
45. Ago
47. Plan
48. At
49. Arc
50. Eat
An

# New EMCAP Radar Coverage Plot

A new capability in EMCAP Version 5.0 is radar coverage plots. This new functionality graphically illustrates predicted radar coverage on the Planning Board. The coverage plot shows the areas where a target of a specific radar cross section should be detected by a particular radar in a battle group.

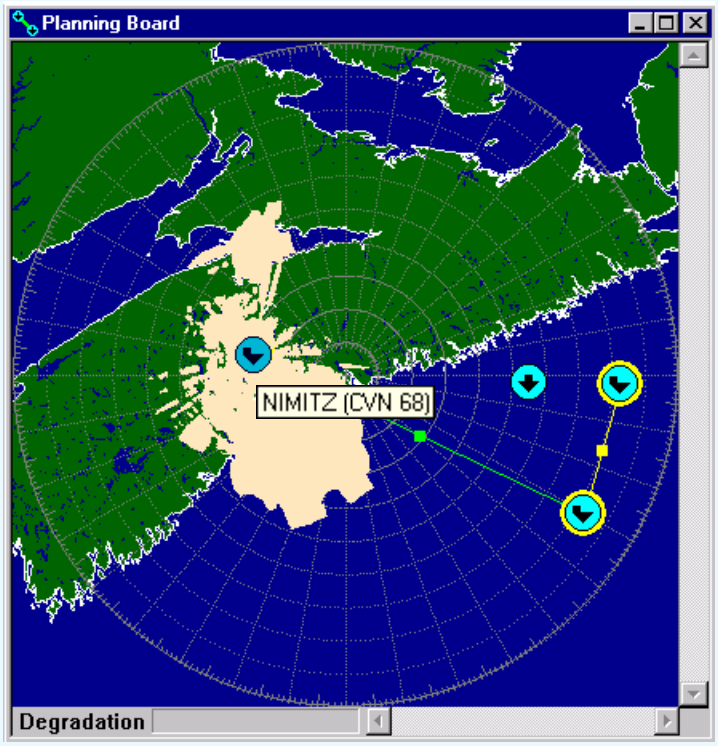
To try out this feature, start EMCAP and open an existing plan or create a new plan. In the Participant List, select a participant and expand its equipment list. Right click on one of the "green" systems and select "Radar Coverage…" to bring up the Radar Coverage Dialog. The dialog is pre-populated with system and target parameters from the database. The values in the dialog can be changed to test different system configurations, models and model parameters, and targets.

Four EMCAP propagation models are available: RPO – Radio Physical Optics, ISL – Interim Space Loss, TIREM – Terrain Integrated Rough Earth Model, and APM – Advanced Propagation Model. TIREM and APM are especially useful near land, although APM plots can take a very long time to run. RPO and ISL do not include the effect of terrain (mountains, valleys, etc.) on propagation.

The plot below illustrates the coverage (using unclassified data) for the AN/SPS-49A(V)1 on the USS NIMITZ (CVN 68) against a low altitude target. The target's elevation is specified above local terrain or sea level. The plot can be toggled on or off using the "View" option on the main menu. The parameters that were used to generate the plot can be viewed by right-clicking on the Planning Board and selecting "Radar Coverage Properties."

Radar coverage can be selected for only one radar at a time in EMCAP Version 5.0, but expansion of coverage plots will be enhanced in future releases. In particular, it is important to note that coverage plots do not consider effects of EMI. So, even if the radar's performance is being degraded by EMI, the coverage plot will be identical to a case with no EMI.

We welcome your feedback on this new capability in EMCAP. Please send your suggestions to the Executive Coordinator address located on page 2.




**Halifax, Nova Scotia**
**AN/SPS-49A(V)1 Radar Coverage aboard USS NIMITZ**

**Radar Coverage Plot:**

- Based on a Single Threat
  - Threat Height = 150 feet
  - Threat Radar Cross Section = 100m$^2$
- Based on a Single Radar
  - AN/SPS-49A(V)1 aboard USS NIMITZ (CVN 68)
- Terrain Dependent Propagation Model
  - Digital Terrain Elevation Data (DTED)